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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

OH, TAYLOR V

ART UNIT	PAPER NUMBER
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1625

DATE MAILED: 08/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/964,849

Applicant(s)

ELLIS ET AL.

Examiner

Taylor Victor Oh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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The finality of the previous Office Action has been withdrawn due to the new ground of the rejection.

The Status of the Claims:

Claims 1-26 are pending.

Claims 1-26 have been rejected.

Claim Rejections - 35 USC § 112

Claims 1-3 and their dependent claims, and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1-3, “ at least one catalyst active for the oxidation of the alkane the corresponding alkene and carboxylic acid” is recited. This expression is vague and indefinite because it’s directed to the Reach –Through Claims. This claim does read on the future catalysts which have not discovered yet and can be active for the oxidation of the alkane the corresponding alkene and carboxylic acid. In order to overcome this rejection , the examiner recommends to add the specific catalyst active for the oxidation of the alkane the corresponding alkene and carboxylic acid in the instant invention, not in the future discovery.

Therefore, an appropriate correction is required.

In claim 5, the phrase " the range 0.8:1 to 1.4 :1" is recited. This is vague and confusing because Claim 5 depends on claim 4 , in which the range is from 10:1 to 1:10. The range in claim 5 can be rewritten as 8:10 to 14:10 , which is outside of the range of the claim 4. Therefore, an appropriate correction is required.

Claim Rejections - 35 USC § 103

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which

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said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 4, 7, 11-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCain, Jr. et al (U.S. 5,162,578) in view of Manyik et al (U.S. 4,899,003).

McCain, Jr. et al discloses a process of producing acetic acid by reacting ethane or ethylene and oxygen (see col. 1, lines 5-9) in a range of from 0.1 to 50 % (see col. 10, lines 15-17) and steam in a range of from 10 to 30 % (see col. 5, lines 29-30) in the presence of a catalyst system selected from the group comprising molybdenum, vanadium, gallium, palladium, niobium, silicon, indium, tungsten, and etc. (see col. 3, lines 10-27) at a temperature of from 200⁰ to 400⁰ C. and under a pressure of from 1 to 30 atmospheres (see col. 5, lines 55-60) at a GHSV of 200 to 3000 h⁻¹ (see col. 10, lines 1-3). Furthermore, the reaction mixture in the reactor is in the ratio of one mole of ethane or ethylene to 0.01 mole to 3 mole of oxygen and zero to 4 mole or more water in the form of steam (see col. 9, lines 47-52).

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The instant invention, however, differs from the McCain, Jr. et al in that adjusting the molar ratio of alkene to carboxylic acid produced in the oxidation zone by controlling the concentration of alkene introduced in the oxidation zone is unspecified; the oxidation of an alkane to the corresponding alkene and carboxylic acid is not mentioned; the ratio of alkene to carboxylic acid is in the range of 0.8 :1 to 1.4:1 ; and the product stream comprises carbon dioxides in an amount of less than 15 mol. %.

Manyik et al discloses a process of producing ethylene and acetic acid by reacting ethane and oxygen in the presence of a catalyst system selected from the group comprising molybdenum, vanadium, palladium, niobium, tungsten, and etc. (see col. 7 ,lines 1-13) at a temperature greater than 250⁰ C. (see col. 5 ,lines 44-46) and under a pressure of from 1 to 40 atmospheres at a GHSV of 500 to 6000 h⁻¹ (see col. 6 ,lines 49-54), thereby obtaining the molar ratio of alkene to carboxylic acid (12.11 : 4) in the total output (see col. 15, Table 4).

Furthermore, Manyik et al expressly indicates the importance of controlling the molar ratio of alkene to carboxylic acid during the process in the following passages (see col. 3 ,lines 10-18):

The mole ratio of ethylene to acetic acid defines the relative yield of these products. It will be described herein, process steps for changing this ratio for use in a commercial viable process according to the invention. Thus, a commercial process can be carried out to favor the production of ethylene at the expense of acetic acid or to favor the production of acetic acid at the expense of ethylene.

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Moreover, except for the first stage, the input gaseous stream of each stage contains ethane, ethylene, acetic acid, CO₂, and gases, and water (see col. 4, lines 64-66); in addition, the certain amount of the water employed in the reaction process is between 0 and 10 mole percent of the input gaseous stream (see col. 6, lines 6-8), whereas the product stream comprises carbon dioxides in an amount of 1.27 mol. % (see col. 15, table 4). Moreover, the addition of water to the input gaseous stream of each stage results in a high acetic acid selectivity and a low ethylene selectivity in comparison with the system without adding water between the stages (see col. 16, lines 27-31).

Concerning the ratio of alkene to carboxylic acid in the range of 0.8 :1 to 1.4:1, Manyik et al does teach the molar ratio of alkene to carboxylic acid (3 : 1) in the total output. However, the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the similar condition during the process in the absence of an unexpected result. Furthermore, the limitation of a process with respect to ranges of pH, time and a ratio does not impart patentability to a process when such values are those which would be determined by one of ordinary skill in the art in achieving optimum operation of the process. The ratio is well understood by those of ordinary skill in the art to be a result-effective variable, especially when attempting to control selectivity of a chemical process. Therefore, it would have been obvious to the skillful artisan in the art to have motivated to optimize the ratio between the carboxylic acid and the alkene in the Manyik et al by a routine experimentation.

Manyik et al does teach the process of producing ethylene and acetic acid by reacting ethane and oxygen in the presence of the catalyst system comprising molybdenum, vanadium, , palladium, niobium, tungsten, and etc. at a temperature greater than 250°C . and under a pressure of from 1 to 40 atmospheres at a GHSV of 500 to 6000 h^{-1} . Also, McCain, Jr. et al discloses a process of producing acetic acid by reacting ethane or ethylene and oxygen, and steam in the presence of the catalyst system comprising molybdenum, vanadium, gallium, palladium, niobium, silicon, indium, tungsten, and etc. at a temperature of from 200° to 400°C . and under a pressure of from 1 to 30 atmospheres at a GHSV of 200 to 3000 h^{-1} .

Manyik et al does teach the use of ethane in the process of producing ethylene and acetic acid, whereas McCain, Jr. et al does point out that of either ethylene or ethane in the process of producing acetic acid; therefore, there is a teaching of an equivalence between ethylene and ethane for producing acetic acid with respect to the starting material. Furthermore, the Manyik et al does offer guidance for the instant process by means of controlling the molar ratio of alkene to carboxylic acid because, by changing this ratio, the outcome of the desired product will be changed; also, the addition of water to the input gaseous stream of each stage can play an important role as to the high acetic acid selectivity with reducing the low ethylene selectivity.

Both processes can be employed to produce acetic acid either by choosing ethane or ethylene. Therefore, it would have been obvious to the skillful artisan in the art to be motivated to use the teachings of Manyik's et al ethane as the starting material, adjusting the molar ratio of alkene to carboxylic acid, and addition of water to each stage into the McCain, Jr. et al process of producing acetic acid, thereby increasing the productivity of acetic acid. This is because the skilled artisan in the art would expect such modifications to be selective and successful for the productivity of acetic acid as shown in the Manyik's et al.

Claims 2, 3, 5, 6, and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fisher et al (U.S. 3,458,406) in view of Manyik et al (U.S. 4,899,003).

Fisher et al teaches a process of separating methyl acetate and ethyl acetate from vinyl acetate prepared by reacting ethylene with acetic acid in the presence of a reduction-oxidation catalyst (see col. 1 ,lines 15-20).

The instant invention, however, differs from the Fisher et al in that adjusting the molar ratio of alkene to carboxylic acid produced in the oxidation zone by controlling the concentration of alkene introduced in the oxidation zone is unspecified; the oxidation of an alkane to the corresponding alkene and carboxylic acid is not mentioned; and the ratio of alkene to carboxylic acid is in the range of 0.8 :1 to 1.4:1 .

Manyik et al discloses a process of producing ethylene and acetic acid by reacting ethane and oxygen in the presence of a catalyst system selected from the group comprising molybdenum, vanadium, , palladium, niobium, tungsten, and etc. (see col. 7 ,lines 1-13) at a temperature greater than 250°C . (see col. 5 ,lines 44-46) and under a pressure of from 1 to 40 atmospheres at a GHSV of 500 to 6000 h^{-1} (see col. 6 ,lines 49-54), thereby obtaining the molar ratio of alkene to carboxylic acid (12.11 : 4) in the total output (see col. 15, Table 4).

Furthermore, Manyik et al expressly indicates the importance of controlling the molar ratio of alkene to carboxylic acid during the process in the following passages (see col. 3 ,lines 10-18):

The mole ratio of ethylene to acetic acid defines the relative yield of these products. It will be described herein, process steps for changing this ratio for use in a commercial viable process according to the invention. Thus, a commercial process can be carried out to favor the production of ethylene at the expense of acetic acid or to favor the production of acetic acid at the expense of ethylene.

Moreover, except for the first stage, the input gaseous stream of each stage contains ethane, ethylene, acetic acid, CO_2 , and gases, and water (see col. 4, lines 64-66); in addition, the amount of the water employed in the reaction process is between 0 and 10 mole percent of the input gaseous stream (see col. 6 ,lines 6-8), whereas the product stream comprises carbon dioxides in an amount of 1.27 mol. % (see col. 15, table 4).

Concerning the ratio of alkene to carboxylic acid in the range of 0.8 :1 to 1.4:1, Manyik et al does teach the molar ratio of alkene to carboxylic acid (3 : 1) in the total output. However, the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the similar condition during the process in the absence of an unexpected result. Furthermore, the limitation of a process with respect to ranges of pH, time and a ratio does not impart patentability to a process when such values are those which would be determined by one of ordinary skill in the art in achieving optimum operation of the process. The ratio is well understood by those of ordinary skill in the art to be a result-effective variable , especially when attempting to control selectivity of a chemical process. Therefore, it would have been obvious to the skillful artisan in the art to have motivated to optimize the ratio between the carboxylic acid and the alkene in the Manyik et al by a routine experimentation.

Manyik et al does teach the process of producing ethylene and acetic acid by reacting ethane and oxygen in the presence of the catalyst system comprising molybdenum, vanadium, palladium, niobium, and tungsten; furthermore, the Manyik et al does offer guidance for the instant process by means of controlling the molar ratio of alkene to carboxylic acid because, by changing this ratio , the outcome of the desired product will be changed.

Also, Fisher et al does teach the process of separating methyl acetate and ethyl acetate from vinyl acetate prepared by reacting ethylene with acetic

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acid in the presence of the reduction-oxidation catalyst. The Manyik et al is directly related to the process of producing intermediate compounds, such as ethylene and acetic acid, whereas the Fisher et al has focused the production of the final products, alkyl carboxylate and alkenyl carboxylate by using those ethylene and acetic acid intermediates.

They are in a relationship between the intermediates and the final products. Therefore, if the skilled artisan in the art had desired to extend from the process of ethylene and acetic acid to that of producing both alkyl carboxylate and alkenyl carboxylate, it would have been obvious to the skillful artisan in the art to be motivated to incorporate the teachings of Manyik's et al ethane as the starting material and adjusting the molar ratio of alkene to carboxylic acid into the Fisher et al process. This is because the skilled artisan in the art would expect the combined processes to be successful as shown in the Fisher et al process.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Taylor Victor Oh whose telephone number is 571-272-0689. The examiner can normally be reached on 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cecilia Tsang can be reached on 571-272-0562. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free):

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